

Opportunities For Wind In The APX Green Power Market™

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Table of Contents

[ABSTRACT](#)

[INTRODUCTION](#)

[HOW THE APX GREEN POWER MARKET OPERATES](#)

[PRICES IN THE GREEN POWER MARKET](#)

[SCHEDULE COORDINATION](#)

[THE PROPOSED APX GREEN TICKET MARKET](#)

[OPPORTUNITIES FOR WIND POWER PLANTS IN THE APX GREEN POWER MARKET](#)

ABSTRACT

The restructured electricity market began in California at 12:01 am on April 1, 1998. Automated Power Exchange (APX) opened the APX Electricity and Green Power Markets at noon on March 30, 1998, allowing suppliers and buyers of renewable energy to do business with each other cheaply, easily, and directly. Based on surveys indicating consumers are willing to pay a premium price for certified renewable energy, the APX Green Power Market allows supply and demand to establish a market-based price for renewable energy.

The APX Green Power Market is the first forward, physical market specifically designed to facilitate direct transactions between suppliers and purchasers of renewable energy. Access to the APX Green Power Market is currently limited to the California market and to those resources that meet the California Energy Commission's definition of a registered renewable supplier located in the state of California. Buyers can purchase the percentage they need of green power and make up the remainder from the APX Electricity Market, which represents all the other "brown" energy resources.

The development of this market provides an important step towards helping the renewable energy community understand what value consumers place on renewable energy. This information is essential for wind developers as they look for opportunities to finance new wind projects in a competitive electricity market.

INTRODUCTION

Automated Power Exchange was founded in 1996 to offer a market to buyers and sellers of electricity that was simple to understand and easy to use. The easiest way to understand how the APX markets work is to think of commodity markets where prices respond to the forces of supply and demand. The APX Electricity and Green Power Markets are markets for the delivery of electricity during every hour of the day. APX opens the market for each hour 168 hours in advance, providing buyers and sellers with a full week's time to establish their position for each hour. The markets are open continuously during this time, closing only at the last moment in which a schedule needs to be sent to the California Independent System Operator (ISO).

APX takes no position or title in any of the power that trades through its markets. In this way, APX maintains its impartiality as a disinterested facilitator of trades among buyers and sellers. All employees of APX must follow a code of conduct that explicitly prohibits them from trading any electricity commodities and from owning any interests in participating firms.

Automated Power Exchange is the only operator in the California market of an exclusively "green" market for renewable energy resources. APX is running this market to support the significant number of consumers and wholesale marketers who are expected to purchase at least some of their electricity requirements from renewable sources. This market provides a place for buyers to buy 100% renewable resources and offers sellers an opportunity to receive a price premium for supplying renewable power to the market.

APX is using the definitions under California's AB 1890 legislation for renewable resource technologies to define which plants can sell into the APX Green Power Market. These include wind, solar, geothermal, biomass, landfill gas, and small hydro (less than 30 MW) facilities. At this time we have further restricted the resources to those which meet the criteria the California Energy Commission (CEC) has set for being eligible for funding from California's Renewable Technology Program.

The APX Green Power Market provides a diversified portfolio of renewable energy supplies for electric service providers, marketers and aggregators. Renewable energy producers, such as wind plants, can sell directly to a large number of buyers that are willing to pay a premium price for energy from environmentally preferred resources.

Eventually, the prices from the APX Green Power Market will provide project developers with a reliable market indicator that can be used to make investment decisions for new renewable projects.

HOW THE APX GREEN POWER MARKET OPERATES

The APX Green Power Market is very easy to use. A seller submits an order to sell a certain quantity of energy during each hour in a day. The seller can submit a "market" order, which means it is willing to sell at whatever price exists in the market, or the seller can submit a "limit" order, specifying the minimum price at which it is willing to sell. Similarly, a buyer submits either a market order to buy at the market price, or a limit order, specifying the maximum price at which it is willing to purchase. A market price is established and contracts are made whenever a buyer and seller are willing to accept the price for an agreed upon quantity.

The market for each hour opens 168 hours ahead of the hour of delivery and stays open until about two hours before delivery. For baseload plants, an operator can submit its orders to sell up to a week ahead of delivery, locking in its sales well ahead of when it produces the power. Intermittent generators like wind plants have the flexibility of being able to sell their generation into the market when they know it is available for delivery rather than having to make commitments far in advance of delivery based on uncertain weather. Orders to sell can be submitted up until the last moment that the ISO requires schedules, which is 2 hours and 20 minutes before the hour of delivery begins. Since most wind operators can estimate their expected production a few hours ahead, sales of this power can be made close to delivery.

Buyers and sellers interact with the market via the APX Market Window™, which is an electronic interface to the APX Market Engine™. As this electronic marketplace is open 24 hours a day, 7 days a week, buyers and sellers can place their orders to buy and sell when it is most convenient for them. At its simplest, all that is required is a PC and an Internet connection. This can be done from the wind plant itself or from an office location away from the power plant. Eventually, all of the required automation can be built into the wind plant itself.

PRICES IN THE GREEN POWER MARKET

The price for power on the APX Green Power Markets is determined by a combination of available supply and market demand. If market demand exceeds available supply, the market price will increase to attract sellers. Similarly, if there is an excess of supply compared with market demand, the market price will decrease to attract more buyers.

The APX Green Power Market allows suppliers of renewable energy resources, such as wind power plants, to receive a premium price for their power production. The price premium at which the APX Green Power Market trades above the market for "brown" power is determined by supply and demand. Since green marketers are selling green power to their end-use customers at premium prices, and are also receiving a demand-side "customer credit" incentive from the California Energy Commission, this provides an incentive for them to pay prices above the brown price to procure their

green supplies. For the first six-months of the market, the CEC will be paying a 1.5¢/kWh "customer credit" for each kilowatt-hour of renewable energy that customers buy from eligible in-state resources. With this incentive, a buyer should be indifferent to paying 1.5¢/kWh more for green power than for conventional power. Additionally, since customers are willing to pay more for green power, the premium in the market should reflect at least this 1.5¢/kWh premium. Most marketers are netting-out the effect of this credit to their customers, but it implies that the marketers may be willing to pay a fairly sizable premium for renewable energy that is eligible under the CEC rules.

Wind plant operators may also be approached by marketers wishing to execute bilateral contracts for their output. Marketers will want to purchase this power at the lowest price possible in order to maximize their profits from reselling the power to end-use consumers. They will also want to lock in a low price for a fairly long term in order to be assured of continued profits. However, if the price in the APX Green Power Market is consistently higher than the price offered under a bilateral contract, a generator would be inclined to terminate the contract early to capitalize on higher prices offered in the market.

One approach that we have suggested to many operators is to diversify their portfolio by selling some output under a bilateral contract and some in the APX Green Power Market. This provides a hedge against the risk that the bilateral contract may not provide the best value for your power when shorter term prices rise.

SCHEDULE COORDINATION

Under the deregulated California market, a new entity called a Scheduling Coordinator was created which serves as an interface between generators and the ISO, and loads and the ISO. The Scheduling Coordinator, or SC, submits balanced schedules to the ISO as to the aggregate amounts of generation and load expected from the generators and loads for which it schedules power during every hour of every day. Automated Power Exchange is a registered SC with the California ISO.

APX can act as a wind plants' Scheduling Coordinator for contracts executed in the APX Green Power Market as well as for bilateral contracts. If a generator ends up delivering less than what it has scheduled, the ISO will make up the deficit in the real-time market. Any production that deviates from what has been scheduled with the ISO will be determined by the actual meter readings. The wind plant is responsible for delivering what it has scheduled with the ISO. If a wind plant delivers less than what it schedules, it is responsible for the difference between the real-time price that the ISO charges and the price it received in the APX market. Conversely, if a wind plant delivers more than it schedules, the ISO will pay it the real-time price for deliveries in excess of scheduled quantities. As a Scheduling Coordinator, APX passes through the ISO charges or credits for settlement of these accounts.

THE PROPOSED APX GREEN TICKET MARKET

APX has proposed that, in the future, the industry move toward a "green ticket" market. If APX implements this type of green ticket market, it would replace the

current hourly APX Green Power Market. In a green ticket market, the green power is separated into two components:

***Energy, delivered in real-time, and
Green tickets, created by green generators***

Energy is injected into the electric grid when the power is produced and is consumed by a load close to this time of production. The green ticket, representing each megawatt-hour of green power produced, can be consumed at either 1) the same time as the energy, if there is a coincident green load that consumes green power, or 2) at a later time than the energy, corresponding to the requirements of the green load.

A green ticket market separates the green attribute from the hourly energy production, providing an opportunity to match the purchase of the green attribute with the green demand. Since the hourly demand for green power may not match the hourly production, this allows generators to receive a green premium based on the aggregate green demand, rather than any hourly green demand. This will be particularly beneficial for intermittent generators, such as wind power plants.

A green generator, such as a wind power plant, creates a "green ticket" for every MWH generated each month. The generator sells its energy into the overall hourly electricity market and receives the current market price for this energy. The generator then sells its green tickets into the green ticket market and receives the market-determined green premium for the green attribute. Rather than being generated and consumed at the same time as the energy, the green ticket goes into the monthly green ticket market, during which it can be bought and traded by marketers to meet their specific green power loads. Once the marketer delivers the green component to a consumer, the green ticket is consumed. The tracking of the green tickets assures that the green attribute is sold to an end-use consumer only once.

Only green generators can create green tickets. Each green ticket is worth 1 MWH of 100% renewable energy. Therefore, at the end of one year, the total number of green tickets created for the year will equal the total number of MWHs produced by all certified renewable generators during the year. The Scheduling Coordinator for each green generator can verify through the monthly meter readings for that generator that the total number of tickets created does not exceed the actual production from that generator. Monthly imbalances between a generator's actual production and green ticket releases for each month will be balanced within the next monthly cycle. If a green generator has produced more MWHs than the number of green tickets it has sold for the month, the excess green tickets can be carried over to the next month. If a green generator has sold more green tickets for the month than the MWHs actually generated, the deficit can be made up in the following month by generating more MWHs than the number of green tickets it sells, thereby bringing the deficit into balance.

Green loads served by electric service providers will consume green tickets each month representing the green MWHs they are buying in the month. At the end of the month, the Scheduling Coordinator will match the monthly meter readings for the green loads with the green tickets purchased to determine if they are in balance. Similar to the generator, if a green load has bought more green tickets than the amount of green MWHs delivered, they can carry over the excess into the next monthly period, or they can sell the excess green tickets into the green ticket market. If they have purchased more green MWHs than green tickets, as determined by the meter readings, they can bring the deficit into balance during the next month by buying additional green tickets from the green ticket market.

OPPORTUNITIES FOR WIND POWER PLANTS IN THE APX GREEN POWER MARKET

At this time, most wind plants are still operating under their standard offer contracts with the investor-owned utility companies in California. However, the utilities are interested in buying out these contracts to reduce their risk for non-recovery of the CTC (Competitive Transition Charge) as legislated in AB 1890. Once a wind plant is no longer under its utility contract, it is free to sell that power into the APX Green Power Market. In this market, the plant can easily sell its output to a diversified portfolio of buyers who are specifically interested in purchasing renewable energy. Rather than selling to one buyer who has one idea of the value of the energy and what they are willing to pay, the mix of buyers in the APX Green Power Market may all have different price goals in mind, which in aggregate may be higher than any one single buyer under a fixed contract.

Selling into the APX Green Power Market is easier than filling out a computer spreadsheet. APX provides the software for bidding into the market and training classes on how to use the software so that selling into the market is very easy. Computerized systems that monitor the wind plants can be linked to the APX software so that power can be bid into the market automatically, without the need for wind plant operator supervision or intervention.

The APX Green Power Market provides an opportunity for wind power plants to receive the market premium for renewable power. Unlike the California Power Exchange which does not differentiate between renewable and conventional power, the APX Green Power Market provides a one-stop shop for both buyers and sellers of renewable resources in California. As the market develops, the APX Green Power Market will provide a realistic indication of what value the market truly places on renewable power.